National Park Service - Alaska Region
Inventory & Monitoring Program

ECOLOGICAL SUBSECTIONS OF YUKON-CHARLEY RIVERS NATIONAL PRESERVE

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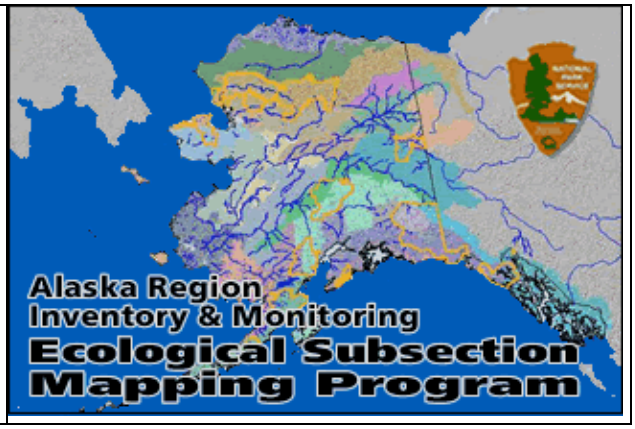

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Introduction

There has been increasing interest in inventory and monitoring of natural resources in National Parks, Monuments, and Preserves in Alaska. However, the choice of where to sample is difficult due to the large area involved. One useful strategy is to stratify sampling by ecosystem regions, to ensure adequate coverage of all ecosystems and economical allocation of the sampling effort. The purpose of this ecological unit map is to aid sampling for inventory and monitoring studies in Yukon-Charley Rivers National Park and Preserve, Alaska (Fig. 1).

The guiding principle in definition of ecosystem regions is that ecosystems consist of the sum of the biotic and abiotic environment, and meaningful boundaries can be drawn that separate zones of relatively uniform ecological conditions (Bailey, 1996; Rowe and Sheard, 1981). Because the various tiers of the ecosystem (geology, landforms, soils, vegetation, etc.) are linked, they tend to change together and can be used in concert to define and map ecosystem regions.

Ecosystem regions (or "ecological units") defined by the above approach can be delineated at various scales, from tiny microsites to global-scale regions. The system of units used here was developed for mapping by the U.S. Forest Service and consists of the numerous levels, intended for use at different scales (Table 1). As discussed below, the units in the present study are *Subsections*, subdivided further into finer units where possible.

Ecosystem regions delineated at the scale of this study are complex mosaics with many different kinds of vegetation and soils. A particular kind of vegetation or soil may occur in more than one unit; for example, lowland black spruce (*Picea mariana*) forest on wet soils with permafrost occurs as a component of many of the ecological units recognized here. However, the exact set of components in an ecological unit, their relative area, and their location on the landscape is unique for each unit. In other words, each unit consists of a mosaic of vegetation, landforms, and soils that is consistent and different from all the other units.

Because this map and write-up are based entirely on remotely-sensed data interpreted during a few weeks in the winter of 1998, they should be considered preliminary. Use of the map and its verification by fieldwork should lead to refinement of boundaries, subdivision or amalgamation of units, and more comprehensive map unit descriptions.

Funding for this study came from the National Park Service Inventory and Monitoring Program, through the Yukon-Charley Rivers National Preserve bird inventory and monitoring project. Photographs were taken by NPS staff in the course of that inventory.

Methods

The ecological units were delineated following the basic principles outlined by Bailey (1996) and Wertz and Arnold (1972). Ecological units were recognized by qualitative interpretation and synthesis of the available data for the study area, using the author's knowledge of what is ecologically important. Quantitative methods (e.g., map overlay and statistical analysis) were not used directly to define the ecological units or draw boundaries, although these methods were used to produce descriptive tables for the ecological units. These ecological units are best thought of as hypotheses about what constitutes ecologically significant regions in the study area, hypotheses that can be tested against any data that may be collected there in the future (Rowe and Sheard, 1981).

According to Bailey (1996), ecological units delineated at the scale of the present study (1:250,000) generally coincide with geologic or geomorphologic features. While geologic and geomorphic features typically determine the boundaries between ecological units in this study, the purpose was not to produce a geologic or geomorphologic map. Instead, the scale of these

features and their close linkage to biotic features make them the best basis for mapping ecological units.

Ecological units were delineated on 1:250,000 scale U.S. Geological Survey topographic maps (the Big Delta, Charley River, Circle, and Eagle, Alaska quadrangles). Because of the scale of mapping, line placement is accurate to within about 500 m. Users should be careful when enlarging the map to scales larger than it was drawn (i.e. larger than 1:250,000). Boundaries were drawn by mentally synthesizing the topographic information with data from the following references:

- High-altitude color-infrared aerial photographs (1:60,000 scale, 1979-1984) viewed in stereo for landforms and vegetation;
- Geologic maps (1:250,000 scale) for major bedrock geologic features (Brabb and Churkin, 1969; Dover and Miyaoka, 1988; and Foster, 1976); and
- Land cover maps (1:63,360 scale, Ducks Unlimited, 1998) classified from Thematic Mapper satellite imagery for vegetation and other land cover classes.

In response to the needs of the expected users of the maps, ecological units were delineated as finely as the methods would allow. Ecological *Subsections* were delineated and named by conventions outlined in Cleland *et al*. (1997). Most of the subsections could be readily subdivided into more detailed units. However, not all of these more detailed units are fine enough to qualify as the next level down in the National Hierarchical Framework of Ecological Units, the *Landtype Association* (Table 1; Cleland *et al*., 1997). Furthermore, field sampling would be needed to verify the composition of any landtype associations. Thus the finer units are here referred to simply as "detailed ecological units".

Boundaries of all ecological units were inked on mylar overlays on mylar 1:250,000 topographic maps, scanned, and digitized as a georeferenced coverage in ARC/INFO 7.2. Digitizing was done into a UTM projection to match the topographic base map and then projected into decimal degrees for use in ArcView. The fields in the polygon attribute table of this coverage are:

AREA	polygon area in units of decimal degrees
PERIMETER	polygon perimeter decimal degrees
YUCH_SUBSEC#	ARC/INFO's internal polygon identification number
YUCH_SUBSEC-ID	user-option polygon identification number
PARK_CODE	four-character NPS abbreviation for the park unit or units where the polygon occurs
ECOREGION	from an unpublished map by G. Nowacki, P. Spencer, T. Brock, M. Fleming, and M. Torre Jorgenson, 6/2000
SECTION_NA	full name for the ecological section
SUBSECT_CO	symbol for the ecological subsection
SUBSECT_NA	full name of the ecological subsection
DETSUB_CO	symbol for detailed ecological unit
DETSUB_NA	full name of detailed ecological unit
PHYSIOGRAP	physiography (landform) descriptor
LITHOLOGY	lithology (rock or sediment) descriptor
MANUSCRIPT_LINK	name and section of html document, to be used as a hotlink field in ArcView.
The coverage contains 229 polygons, classified into 14 subsections and 29 detailed ecological units.	

Fire history information available from the U.S.D.I. Bureau of Land Management, Alaska Fire Service (ARC/INFO coverage of fire history from the 1950 through 1996) was used to determine the time since fire for the ecological units. Soil information is somewhat speculative, based on geology and aerial photograph interpretation of vegetation and landforms, drawing on the author's experience in similar regions elsewhere in interior Alaska. Vegetation information in the map unit descriptions is based on the earth cover classification of the Preserve by Ducks Unlimited (1998) and interpretation of aerial photographs. Earth cover information in the tables is drawn directly from overlay of the Ducks Unlimited maps. The earth cover classification

scheme used by the Ducks Unlimited maps corresponds closely to level III in the Alaska Vegetation Classification (Viereck *et al*., 1992), with the addition of several non-vegetation classes such as "Rock/Gravel" and "Cloud".

Use of the Ecological Units in Wildlife Studies

This ecological unit inventory provides habitat information that may be useful in wildlife studies. The most likely uses are to stratify a study area for sampling, and then, during data analysis, to test hypotheses about where (in what habitat types) certain species or behaviors occur. I also hope that the concept of ecosystem regions will become familiar to users and the regions delineated here will be used informally to exchange information about the Preserve. But first, a *warning about map scale and use of this map*. A GIS such as ArcView can readily magnify regions of this map to any scale, and problems may result. When this map is enlarged beyond 1:250,000 scale, some line placement errors will become apparent. Also, because satellite imagery was *not* used as a basemap (topographic maps were the only basemap used), there may be line placement error in regions where vegetation is a better guide to ecological unit boundaries than topography. When determining the ecological unit of any sample point within about 1 km of a boundary on the map, users should beware that line errors could result in assignment of the wrong ecological unit. In such cases, users are advised to check the map unit descriptions against site data, a topographic map, satellite image, and/or aerial photograph to ensure correct classification of the sample point.

Stratification of study areas for sampling. These ecological units may be used to partition a study area to ensure adequate sample coverage of an entire study area. The level of ecological unit used can be adjusted to match the size of the study area. If the study area is large (thousands of square kilometers; perhaps a quarter of the Preserve or more), the user could use the ecological subsections to produce correspondingly large map areas for stratification. On a more detailed level, the user may want to use the detailed ecological units.

Wildlife Habitat Classification. The ecological units may be used as wildlife habitat classes, or combined with other data layers such as fire history or earth cover class to produce wildlife habitat classes. These classes could in turn be used to test hypotheses about wildlife occurrence or habitat use. For example, one might test whether moose density is higher in ecological unit "Tintina Hills" than in other units. Or, one might test whether moose density is higher in the 1969 burn in the Tintina Hills than in other ecological units or in unburned parts of the Tintina Hills.

Perhaps the most promising method would be to combine the ecological units with earth cover classes. It is reasonable to ask "Why bother with the ecological units if you know the earth cover class?" The answer is that many earth cover classes are not uniform across the entire Preserve. For example, the cover class "Closed Deciduous Forest" occurs on the Yukon River floodplain (this is probably mostly riparian *Balsam poplar* forest) and on south-facing hillslopes in the various hill units (this is probably mostly post-fire successional paper birch *Betula papyrifera* or aspen *Populus tremuloides* forest). The habitat conditions and animals species present are likely to differ between these two situations, and the ecological units can be used to differentiate them. The results of a simple overlay of the detailed ecological units map and the earth cover map are given in Table 5. Each cell of this table is a potential habitat class. There are 841 cells (far too many to sample for most studies) and many cells are blank because they represent combinations that do not exist.

To help workers narrow down this long list of possible habitat classes, earth cover classes that comprise less than 5% of their respective ecological unit were eliminated and the absolute areas of the remaining combinations given in Table 6. Aggregation of these potential habitat classes will probably still be needed, as Table 6 still contains more classes than can be adequately sampled in most studies. To accomplish this, similar earth cover classes - entire columns in Table 6 - could be aggregated, such as the Low Shrub-Tussock Tundra and the

Tussock tundra classes. Likewise, similar ecological units - entire rows in Table 6 - could be aggregated, such as the Tintina Hills (TH) and Biederman Hills (BH1). Or, one could aggregate only selected cells in Table 6; for example, "Closed Deciduous Forest" in the Tintina Hills and Biederman Hills. Aggregations should be based on the researcher's knowledge of the wildlife species in question and, if possible, familiarity with the field conditions in the region.

Ecological units that are good candidates for aggregation are:

floodplains and low terraces: YV1, YV2, YV3, YV4, YV6, YV7
lowlands: HL, KT, TL, YV5
hills: BH1, CF, LB1, OF1, TH
riverside bluffs: BH2, LB2, OF2
mountain valleys: UC1, UC2, UC3, UC4, TF (exception: the forests in UC4 probably should not be joined to others)
mountain tundra: MT1, MT2, MT3, SD (note: forests in this group are rare and could be joined with forests in the mountain valley group)

These groupings do not imply that, for example, MT2 and MT3 are nearly identical, but only that a given earth cover type mapped in MT2 is likely to be similar to that cover type where mapped in MT3. For example, "Low Shrub - Tussock Tundra" occurs in both MT2 and MT3 and is probably fairly similar in both units, but it is much more widespread in MT3.

For hypothesis testing about use of these habitat classes by wildlife, users will probably need to compare measures of wildlife use for each unit with expected values for use generated from their sampling scheme. In general, $E_{AZ} = N_Z(A/N)$, where

E_{AZ} - expected value (counts) of species A in habitat class Z
N_Z - count of observations (samples) in habitat class Z
A - total count of species A in the study area
N - total count of observations (samples) in the study area

Because many of the potential classes Tables 5 and 6 are in fact nonexistent, it is not a standard two-dimensional contingency table as it might first appear. A habitat classification derived from it would in fact be a simple one-way classification, and the degrees of freedom for goodness-of-fit tests using these habitat classes would be the number of habitat classes used (after any aggregation) minus one.

Ecological Unit Descriptions

The map legend for ecological units in Yukon-Charley Rivers National Preserve is given in Table 2. The criteria used to delineate the subsections are summarized in Table 3. For the sum of area covered by each ecological subsection and detailed ecological unit, see the map unit descriptions and Table 3. The areas and elevations given refer only to the portion of any ecological unit that occurs in Yukon-Charley Rivers National Preserve. For areas of the earth cover classes composing the detailed ecological units, see Tables 4 and 5. For areas of the detailed ecological units burned by year, see Table 6. For climatic data at two stations near the Preserve, see Tables 7 and 8

A map of subsections in Yukon-Charley Rivers National Preserve is given in Fig. 2. For locations of the detailed ecological units, see the ARC/INFO coverage that accompanies this report.

BH Biederman Hills Subsection

The Biederman Hills Subsection consists mostly of rounded hills with spruce and paper birch forest.

Detailed ecological units in the Biederman Hills Subsection:
BH1 Biederman Hills - 542 km^2
BH2 Biederman Hills bluffs - 28 km^2

Note: Detailed ecological unit BH1 makes up most of this subsection. Unit BH2 occurs on steep slopes near the Yukon River.

BH1 Biederman Hills

Geology and physiography: moderately steep forested hills composed of sedimentary rocks (mostly argillite), mostly north of the Yukon River.
Elevation: 1000 to 2800 feet
Soils: mostly dry and probably rocky soils derived from bedrock and colluvium on upper slopes and south slopes. Wetter soils with permafrost on north slopes and lower slope positions.

Vegetation/land cover: mostly paper birch forest in burns and mixed birch and white spruce forest where not burned; black spruce forest on some north slopes and lower slopes.
Fire history: major burns in 1950 and 1986. The creek drainage northwest of Andrew Creek is the only part of unit BH1 that has what appears on aerial photographs to be late-successional (spruce-dominated) vegetation.
Notes: vegetation on this unit appears similar to other hill units (units OF1 and TH). Unit BH1 is intermediate in steepness between these two units and, unlike unit OF1, has rounded ridge crests with little exposed bedrock.

BH2 Biederman Hills bluffs

Geology and physiography: steep south-facing bluffs composed of sedimentary rocks (mostly argillite) and volcanic rocks, north of the Yukon River.
Elevation: 800 to 2500 feet
Soils: mostly dry and rocky soils derived from bedrock and colluvium.
Vegetation/land cover: birch and aspen forest, mixed with spruce in some moister ravines; steppe; sparsely vegetated areas; scree; and exposed rock.
Fire history: major burns in 1950 and 1986. The far western part of unit BH2 appears least disturbed by fire.

CF Charley Foothills Subsection

The Charley Foothills Subsection consists mostly of rounded hills with spruce forest. Hilltops such as those in the right background are gentle and often are near treeline.

Detailed ecological units in the Charley Foothills Subsection:
CF Charley Foothills - 1134 km^2

CF Charley Foothills

Geology and physiography: hills and low mountains composed of granitic and metamorphic rocks, south of the Yukon River and south of the Tintina Fault.

Elevation: 1600 to 3800 feet
Soils: mostly dry and probably rocky soils derived from bedrock and colluvium on upper slopes and south slopes. Wetter soils with permafrost on north slopes and nearly level summits.
Vegetation/land cover: mostly sparse spruce forest; paper birch forest on south-facing slopes; and sedge tussocks or low shrubs on summits.
Fire history: The 1991 fire was confined largely to this unit. Other fires occurred in 1950, 1969, and 1993. Elsewhere there are no recorded burns and vegetation is appears to be late-successional (spruce-dominated).
Notes: this unit is higher in elevation than the adjacent hill unit TH and extends into the subalpine zone. Unit CF covers hills adjacent to higher mountains but generally does not occur in valleys surrounded by higher mountains like the adjacent subalpine unit UC2.

HL Hard Luck Lowland Subsection

The Hard Luck Lowland Subsection consists of basins with undulating surface in the Ogilvie Mountains, with black spruce forest (as in this photograph) or cottonsedge tussocks and low shrubs.

Detailed ecological units in the Hard Luck Lowland Subsection:
HL Hard Luck Lowland - 161 km^2

HL Hard Luck Lowland

Geology and physiography: gently sloping basins with soft (Cretaceous and Tertiary) sandstone, mudstone, and conglomerate, probably loess-covered, north of the Yukon River near the Ogilvie Mountains.
Elevation: 1000 to 3000 feet
Soils: probably mostly wet and fine-grained. In burned areas the permafrost has probably receded a few meters below the surface and soils are drier.
Vegetation/land cover: mostly tussock wetlands and black spruce woodland.
Fire history: the southern half of the Hard Luck lowland apparently burned in 1957 and 1967. Exact boundaries for the 1967 fire are not available so the extent of overlap is not known.

The northern half of the lowland has no recorded fires and appears on photos to be at an advanced successional state.

KT Kandik Tableland Subsection

The Kandik Tableland Subsection is mostly gently sloping with black spruce forest. The bare stems in this photograph are black spruce trees killed by a fire, and black spruce trees are growing back on the site.

Detailed ecological units in the Kandik Tableland Subsection:
KT Kandik Tableland - 116 km^2

KT Kandik Tableland

Geology and physiography: gently sloping surface dissected by small streams, composed of Cretaceous argillite (probably loess-covered), mostly north of the Yukon River.

Elevation: 1000 to 2150 feet

Soils: probably mostly wet, fine-grained, soils with permafrost; permafrost may have receded locally to several meters below the surface due to fires. Drier soils, possibly rocky and probably without permafrost on steeper slopes.

Vegetation/land cover: mostly sparse black spruce forest; birch forest on steeper slopes, especially on burns.

Fire history: fires occurred in 1950 and 1969. Examination of aerial photographs suggests that the 1950 fire was more extensive than indicated by the fire map overlay. Only the far northeast part of this unit appears to have been unaffected by fire for a significant time period.

LB Little Black River Hills Subsection

The Little Black River Hills Subsection includes gentle hills of the Little Black River Hills proper (LB1), and steep slopes leading down from these hills to the Yukon River Valley (the Little Black River Hills Bluffs, LB2). The latter is pictured here. These bluffs are more dissected with ravines and have more spruce that other bluff units in the study area. The plain with lakes in the background is in the Yukon River Valley subsection, unit YV4 (Wet terraces with thermokarst lakes).

Detailed ecological units in the Little Black River Hills Subsection:
LB1 Little Black River Hills - 172 km^2
LB2 Little Black River Hills bluffs - 67 km^2

Note: Detailed ecological unit LB1 makes up most of this subsection. Unit LB2 occurs only on steep slopes near the Yukon River.

LB1 Little Black River Hills

Geology and physiography: gentle forested hills composed of Paleozoic and older sedimentary rocks, basalt, and gabbro, probably with loess cover, north of the Yukon River.
Elevation: 1000 to 2600 feet
Soils: vary greatly with fire succession and slope position. Unburned areas appear to have rather wet soils with permafrost except on hill crests. In burned areas the permafrost has probably receded a few meters below the surface and soils are drier.
Vegetation/land cover: probably mostly scrub in the extensive 1986 burn. Elsewhere mostly black spruce forest with paper birch forest in burns, especially on steeper slopes.
Fire history: burned in 1954, 1977, and 1986. Areas without recorded burns and having what appears to be late-successional (spruce-dominated) vegetation occur just north of the 1986 burn.
Notes: this unit is gentler than other bedrock hill units (units OF1, TH, and BH1), with correspondingly moister soils and more black spruce.

LB2 Little Black River Hills bluffs

Geology and physiography: steep, mostly south- and west-facing slopes composed of Paleozoic and older sedimentary rocks, basalt, and gabbro, north of the Yukon River.

Elevation: 700 to 2500 feet.
Soils: mostly dry, rocky soils lacking permafrost.
Vegetation/land cover: birch and aspen forest, mixed with spruce in some moister ravines; steppe; sparsely vegetated areas; scree; and exposed rock.
Fire history: burned in 1977 and 1986. It appears from aerial photographs that the 1977 burn covered the adjacent LB1 unit but did not advance down the bluff (LB2) very far.
Notes: this unit is generally not quite as steep and more densely vegetated than the other bluff units (OF2 and BH2). It contains a large landslide in Township 9N Range 19E section 35 that apparently came down between 1956 (topographic map date) and 1986 (aerial photograph date).

MT Upper Charley Mountain Tundra Subsection

The Upper Charley Mountain Tundra Subsection includes both gently sloping areas with low shrubs and herbaceous vegetation, such as that visible in the foreground, and higher areas with more exposed rock and steeper slopes, such as those visible in the background.

Detailed ecological units in the Upper Charley Mountain Tundra Subsection:
MT1 Upper Charley Mountain Tundra: high and rugged - 122 km^2
MT2 Upper Charley Mountain Tundra: barren domes - 1305 km^2
MT3 Upper Charley Mountain Tundra: gentle vegetated ridges - 1041 km^2

MT1 Upper Charley Mountain Tundra: high and rugged

Geology and physiography: steep mountains with cliffs and sharp ridge lines, cirques; composed of granitic rocks and schist; above treeline in the upper Charley River region.
Elevation: 3500 to 6600 feet
Soils: dry and rocky soils derived from bedrock and colluvium.
Vegetation/land cover: sparsely vegetated with considerable rock rubble and bedrock exposed at the surface in cliffs; patches of herbaceous plants or dwarf shrubs on gentle slopes.
Fire history: no recorded fires. Almost no fuel present to carry fires.

Notes: typically occurs above unit MT2 in a given group of mountains.

MT2 Upper Charley Mountain Tundra: barren domes

Geology and physiography: steep but generally rounded mountains composed of granitic rocks and schist, above treeline in the upper Charley River region.
Elevation: 3000 to 6300 feet
Soils: dry and rocky soils derived from bedrock and colluvium.
Vegetation/land cover: sparsely vegetated with considerable rock rubble at the surface on ridges; low or dwarf shrub and herbaceous plants in valleys.
Fire history: no recorded fires. Little fuel present to carry fires.
Notes: typically occurs above unit MT3 and/or below unit MT1 in a given group of mountains.

MT3 Upper Charley Mountain Tundra: gentle vegetated ridges

Geology and physiography: rounded mountains composed of granitic rocks and schist, above treeline in the upper Charley River region.
Elevation: 2600 to 4800 feet
Soils: mostly dry and rocky soils derived from bedrock and colluvium. Some finer-grained, wetter soils with permafrost near the surface on gentle, concave slopes.
Vegetation/land cover: mostly shrub vegetation with some tussock tundra; sparsely vegetated areas with considerable rock at the surface are present on ridges but compose little of the unit.
Fire history: no significant recorded fires. Little fuel present to carry fires and vegetation is probably not highly flammable.
Notes: typically occurs below unit MT2 in a given group of mountains.

OF Ogilvie Foothills Subsection

The Ogilvie Foothills Subsection consists of steep hills forested with paper birch and spruce. The higher hills in the background are more typical of the unit than the gentler foreground.

Detailed ecological units in the Ogilvie Foothills Subsection:
OF1 Ogilvie Foothills - 1176 km^2
OF2 Ogilvie Foothills bluffs - 35 km^2

Note: Detailed ecological unit OF1 makes up most of this subsection. Unit OF2 occurs only on steep slopes near the Yukon River.

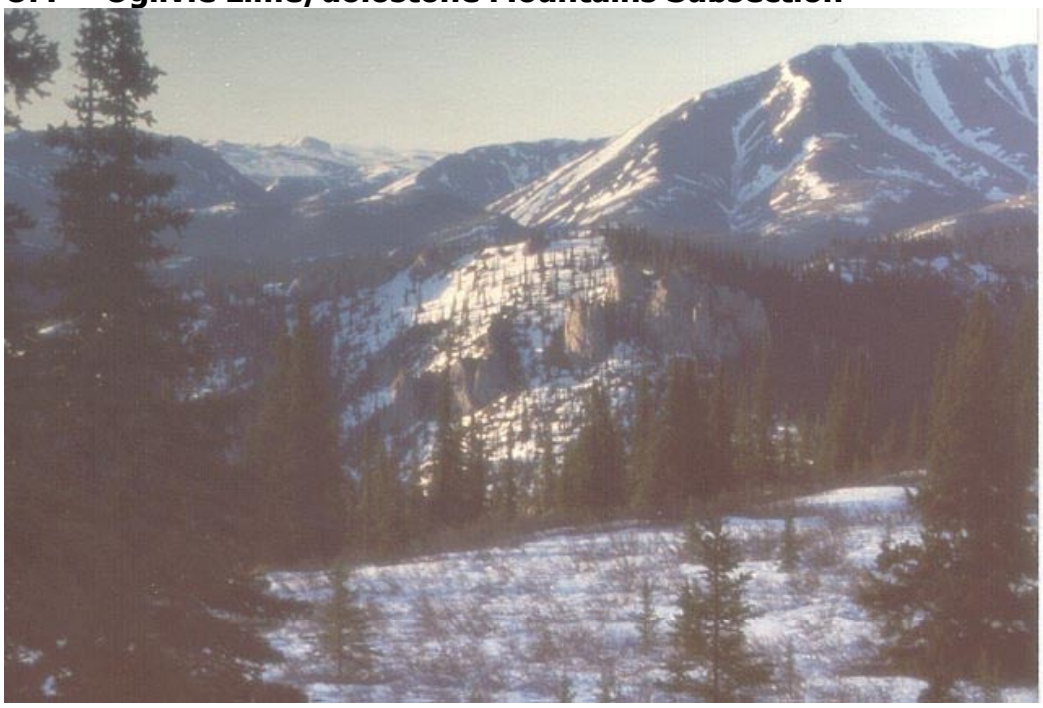
OF1 Ogilvie Foothills

Geology and physiography: steep forested hills composed of complexly folded and faulted, hard sedimentary rocks.
Elevation: 1000 to 3800 feet
Soils: dry and rocky soils derived from bedrock and colluvium.
Vegetation/land cover: paper birch (especially on burns) and spruce forest, with a little rock rubble on slopes and sparse vegetation or rock knobs on high ridge tops.
Fire history: burns in 1969 and 1971; some parts lack recorded burns and have what appears on aerial photographs to be late-successional (spruce-dominated) vegetation.
Notes: vegetation on this unit appears similar to other hill units (units TH and BH1) but unit OF1 is steeper and has more exposed bedrock.

OF2 Ogilvie Foothills bluffs

Geology and physiography: steep south-facing slopes composed of complexly folded and faulted, hard sedimentary rocks.
Elevation: 800 to 3100 feet
Soils: dry and rocky soils derived from bedrock and colluvium.
Vegetation/land cover: birch and aspen forest, mixed with spruce in some moister ravines; steppe; sparsely vegetated areas; scree; and exposed rock..
Fire history: map analysis indicates small areas burned in 1969 and 1971, but the extent of those fires in unit OF2 is uncertain. Most of the Kathul Mountain region of OF2 appears to have post-fire deciduous vegetation. The vegetation that appears to be most mature (spruce-dominated) in OF2 is near the mouth of the Nation River.

OM Ogilvie Lime/dolostone Mountains Subsection



OM The Ogilvie Line/dolostone Mountains Subsection consists of steep mountains with sharp ridge crests of exposed rock. Lower slopes are forested. Photo date 6 June 2000.

Detailed ecological units in the Ogilvie Line/dolostone Mountains Subsection:
OM Ogilvie Lime/dolostone Mountains - 208 km^2

OM Ogilvie Lime/dolostone Mountains

Geology and physiography: steep mountains with cliffs and sharp ridge lines; composed of limestone, dolostone, and other sedimentary rocks.
Elevation: 2000 to 4800 feet
Soils: dry and rocky soils derived from bedrock and colluvium.
Vegetation/land cover: ridges are sparsely vegetated with some rock rubble and bedrock exposed at the surface; slopes have dry herbaceous vegetation or shrubs, with birch and spruce forest at low elevations.
Fire history: most areas not burned since records began (1950s). A small portion may have burned in 1996.
Notes: this unit has different bedrock than other high mountain units and is steeper.

SD Snowy Domes Subsection

Detailed ecological units in the Snow Domes Subsection:
SD Snowy Domes - 12 km^2

SD Snowy Domes Subsection

Geology and physiography: steep but generally rounded mountains composed of sedimentary rock (conglomerate, with minor limestone and shale), north of the Yukon River; mostly above treeline.

Elevation: 2600 to 3200 feet

Soils: dry and rocky soils derived from bedrock and colluvium, and probably some wet soils with permafrost in tussocky areas.

Vegetation/land cover: mostly low or dwarf shrub and tussock tundra; some spruce woodland near treeline.

Fire history: the 1986 fire probably affected the near-treeline part of this unit and then stopped. Little fuel present to carry fires above treeline.

Notes: most of this unit occurs north of the preserve on Snowy Peak.

TF Three Fingers Subalpine Basin Subsection

The Three Fingers Subalpine Basin consists of rounded low hills surrounded by higher mountains. It lies near treeline, hence much of it has mid- to low shrub vegetation such as the area pictured here.

Detailed ecological units in the Three Fingers Subalpine Basin Subsection:

TF Three Fingers Subalpine Basin - 273 km^2

TF Three Fingers Subalpine Basin

Geology and physiography: hills composed of granitic rocks and schist near treeline in the upper Charley River region.

Elevation: 3000 to 4200 feet

Soils: derived from weathered bedrock and colluvium, with a surface peat layer in low areas. Soils in lowlands are wet and have permafrost, while higher on slopes they are dry and rocky.

Vegetation/land cover: mostly sedges (tussocks) and low shrubs in low areas, shrubs with a few trees on slopes, and herbaceous vegetation or dwarf shrubs on hilltops.

Fire history: no recorded fires. Vegetation has relatively low flammability, and no obvious fire scars were seen on aerial photos.

Notes: this unit is fairly similar to units UC1 and UC2, but occurs in a broad basin dissected into gentle hills. UC1 differs in being only isolated U-shaped valleys surrounded by mountains, while unit UC2 occurs in steeper valleys.

TH Tintina Hills Subsection

TH The Tintina Hills are rounded hills forested mostly with paper birch and spruce.

Detailed ecological units in the Tintina Hills Subsection:
TH Tintina Hills - 1158 km^2

TH Tintina Hills

Geology and physiography: relatively gentle forested hills composed mostly of soft sandstone, mudstone, and conglomerate, south of the Yukon River.

Elevation: 1000 to 2500 feet

Soils: mostly dry and probably rocky soils derived from bedrock and colluvium on upper slopes and south slopes. Wetter soils with permafrost on north slopes and lower slope positions.

Vegetation/land cover: mostly paper birch forest in burns and mixed birch and white spruce forest where not burned; black spruce forest on some north slopes and lower slopes.

Fire history: a small portion of this unit burned in 1950, and then most burned in 1969. Areas without recorded burns and having what appears to be late-successional (spruce-dominated) vegetation occur in the far western and far eastern parts.

Notes: vegetation on this unit appears similar to hill units OF1 and BH1, but unit TH is gentler and has little exposed bedrock.

TL Thanksgiving Loess Plain Subsection

The Thanksgiving loess plain consists mostly of nearly level or gently sloping land forested with black spruce where not recently burned.

Detailed ecological units in the Thanksgiving Loess Plain Subsection:
TL Thanksgiving Loess Plain - 301 km^2

TL Thanksgiving Loess Plain

Geology and physiography: gently sloping plain with thick loess cover; some steep slopes where dissected by small streams; southwest of the Yukon River in the far northwest corner of the Preserve

Elevation: 1000 to 2000 feet

Soils: probably mostly wet, fine-grained, soils with permafrost where unburned, but in burned areas soils are drier and permafrost may have receded to several meters below the surface. Drier soils on steep slopes near streams.

Vegetation/land cover: mostly open black spruce forest where unburned and birch forest or bog birch scrub where burned; birch forest has persisted on steep slopes in unburned areas.

Fire history: portions of this plain burned in 1957, 1993, and 1996. Areas outside of these recorded fires appear on photos to be at an advanced successional state.

Notes: this unit is transitional between the surrounding hills and the lower and flatter central portion of Yukon Flats to the north.

UC Upper Charley Valleys Subsection

The Upper charley Valleys Subsection includes a variety of gently sloping valley bottoms and lower slopes surrounded by higher mountains. The subsection is located just below treeline, hence favorable sites have spruce forest, while wetter soils such as the lower slopes in the middle of this photograph have mostly low shrubs and cottonsedge tussocks.

Detailed ecological units in the Upper Charley Valleys Subsection:
UC1 Subalpine valleys - 179 km^2
UC2 Beverly/Copper/East Fork mountain slopes - 856 km^2
UC3 Copper Creek tussock slopes - 96 km^2
UC4 Upper Charley plain - 37 km^2

Note: The various detailed ecological units of subsection UC occur in the following landscape positions. UC1 occurs in the highest and narrowest subalpine valleys. UC2 occurs in deeper and wider valleys with distinct side draws and spurs. UC3 occurs on some unique, gently hillslopes surrounded by the steep UC2. UC4 occurs as a plain along the Charley River in an unusual stretch of the river that is not in a narrow valley.

UC1 Subalpine valleys

Geology and physiography: round-bottomed valleys in mountains composed of granitic rocks and schist, near treeline in the upper Charley River region.
Elevation: 2400 to 3800 feet
Soils: derived from weathered bedrock and colluvium, with a surface peat layer in low areas. Soils in lowlands are wet and have permafrost, while higher on slopes they are dry and rocky.
Vegetation/land cover: mostly sedges (tussocks) and low shrubs in valley bottoms, and sparse spruce forest on slopes; riparian brush along streams.
Fire history: no recorded fires. Vegetation has relatively low flammability, and no obvious fire scars were seen on aerial photos.
Notes: this unit is similar to units TF and UC2. Unit UC1 differs in being only isolated U-shaped valleys surrounded by mountains, while the other two units have more complex topography:

TF contains both valleys and hilltops, while in unit UC2 the valleys are typically a little more V-shaped and incised side streams produce numerous valley-side spurs or ridges.

UC2 Beverly/Copper/East Fork mountain slopes

Geology and physiography: valleys in mountains composed of granitic rocks and schist, near treeline in the upper Charley River region.

Elevation: 2000 to 4000 feet.

Soils: derived from weathered bedrock and colluvium, with a surface peat layer in low areas. Soils in lowlands are wet and have permafrost, while higher on slopes they are dry and rocky.

Vegetation/land cover: sparse spruce forest on slopes, with tussocks and low shrubs in valley bottoms.

Fire history: no recorded fires. Vegetation has relatively low flammability, and no obvious fire scars were seen on aerial photos.

Notes: this unit is similar to units TF and UC1. Unit UC1 differs in being only isolated U-shaped valleys surrounded by mountains, while the other two units have more complex topography: TF contains both valleys and hilltops, while in unit UC2 the valleys are more V-shaped and incised side streams produce numerous valley-side spurs or ridges.

UC3 Copper Creek tussock slopes

Geology and physiography: gentle, north-facing slopes composed of alluvium, colluvium, and/or loess near treeline in the upper Charley River region; dissected by a few ravines with short, steep slopes.

Elevation: 1800 to 2800 feet

Soils: probably mostly wet, fine-grained, soils with permafrost near the surface and a surface peat layer.

Vegetation/land cover: mostly tussock tundra; tall shrubs on steep slopes of ravines.

Fire history: a small part possibly burned in 1994. Herbaceous vegetation probably recovers quickly after fire, with generally minor long-term effects.

UC4 Upper Charley plain

Geology and physiography: floodplain of the Charley River, low terraces, and gentle lower slopes composed of alluvium and colluvium, near treeline in the upper Charley River region.

Elevation: 2500 to 3000 feet

Soils: probably dry and coarse-grained in the riparian zone; on tussocky lower slopes beyond the reach of floods, mostly wet, fine-grained, soils with permafrost near the surface and a surface peat layer.

Vegetation/land cover: floodplain white spruce forest in the riparian zone; mostly tussock wetland on adjacent low slopes; deciduous shrubs and gravel in the large aufeis field where the East Fork of the Charley meets the main fork.

Fire history: no recorded fires. Spruce forest appears on photos to be undisturbed.

YV Yukon River Valley Subsection

The Yukon Valley Subsection includes plains composed of material deposited by the Yukon River and some of its tributaries. A dense spruce forest of the Yukon River Active Floodplain (YV1) is visible in the center of this photograph, on the of a large meander. Just behind it is the wetter YV3 unit with smaller sedges, low shrubs, and smaller trees. Unit YV4 (Wet terraces with thermokarst lakes) is pictured in the background of the photograph of LB, the Little Black River Hills Subsection.

Detailed ecological units in the Yukon River Valley Subsection:
YV1 Yukon River active floodplain - 131 km^2
YV2 Wet terraces with oxbows - 47 km^2
YV3 Wet terraces with few ponds - 327 km^2
YV4 Wet terraces with thermokarst lakes - 14 km^2
YV5 High terraces, undulating - 214 km^2
YV6 Nation/Kandik/Bonanza Valleys - 282 km^2
YV7 Tatonduk Valley - 17 km^2
YV8 Yukon River - 146 km^2

Note: The detail ecological units that make up the Yukon River Valley Subsection generally occur in the following sequence as one moves away from the river and to slightly higher elevations: YV8(Yukon River) - YV1 - YV2 - YV3,4 - YV5. Any of these units may be absent. Thus, for example, YV1 may border directly on YV3, or YV3 may occur on the riverbank without YV1 or YV2. Detailed units YV6 and YV7 occur in tributary valleys.

YV1 Yukon River active floodplain

Geology and physiography: nearly level areas near the Yukon River and flooded at least occasionally; islands in the Yukon River.
Elevation: 600 to 1000 feet
Soils: derived from river deposits of silt, sand, and gravel. Significant areas are well-drained and lack permafrost.

Vegetation/land cover: includes highly disturbed areas with little vegetation, floodplain shrubs, poplar and white spruce forest, and black spruce forest.

Fire history: some areas probably burned in 1969, but mostly unburned. Unit is protected by natural firebreaks (the river, sloughs) and some of the vegetation has inherently low flammability.

Notes: islands in the Yukon River have undoubtedly changed shape since the base map was made. Some islands that belong in this unit are too small to map at 1:250,000 scale and are included in unit YV8 (the Yukon River).

YV2 Wet terraces with oxbows

Geology and physiography: nearly level but rarely flooded areas near the Yukon River, with numerous ponds. Ponds have the elongate form of former river channels.

Elevation: 600 to 1000 feet

Soils: derived from river deposits of silt, sand, and gravel and possibly loess, with a surface peat layer. Soils are wet and most probably have permafrost.

Vegetation/land cover: sparse spruce forest, sedges, and low shrubs. Aerial photograph interpretation suggests mostly sedges and low shrubs rather than forest as shown on the Ducks Unlimited earth cover map.

Fire history: appears to be mostly unburned. Unit is protected by natural firebreaks (The river and sloughs) and much of the vegetation is herbaceous and recovers so quickly from fire that fire scars quickly become indistinct.

Notes: this unit is geologically older and topographically higher than unit YV1, but lower and younger than units YV3, YV4, and YV5. Stream channels are still obvious, in contrast to YV3 and YV4..

YV3 Wet terraces with few ponds

Geology and physiography: nearly level but rarely flooded areas near the Yukon River, with few ponds or lakes.

Elevation: 600 to 1000 feet

Soils: derived from river deposits of silt, sand, and gravel and possibly loess, with a surface peat layer. Soils are wet and have permafrost.

Vegetation/land cover: mostly sedges and low shrubs with sparse spruce trees. Aerial photograph interpretation suggest this unit is mostly tussocks and birch brush rather than forest as shown on the Ducks Unlimited earth cover map.

Fire history: much of the vegetation is herbaceous and recovers so quickly from fire that fire scars quickly become indistinct. Affected by the 1950, 1969, and 1986 fires. Effects of all are probably indistinct by the time of this writing.

Notes: this unit is topographically higher and geologically older than units YV1 and YV2, but lower and younger than YV5. It is distinguished from YV2 and YV4 by the low density of lakes or ponds, although some are present and pond formation by thermokarst is possible anywhere.

YV4 Wet terraces with thermokarst lakes

Geology and physiography: nearly level but rarely flooded areas near the Yukon River, with numerous irregularly shaped small lakes and ponds in thermokarst depressions.

Elevation: 600 to 1000 feet

Soils: derived from river deposits of silt, sand, and gravel and possibly loess, with a surface peat layer. Soils are wet and have permafrost.

Vegetation/land cover: mostly sparse spruce forest, sedges, and low shrubs.

Fire history: appears to be mostly unburned. Unit is protected by natural firebreaks (the river, ponds) and much of the vegetation is herbaceous and recovers so quickly from fire that fire scars quickly become indistinct.

Notes: this unit is similar to YV3 but with a higher density of lakes and ponds.

YV5 High terraces, undulating

Geology and physiography: level to gently sloping areas on old terraces near the Yukon River but rarely or never flooded; a few thermokarst ponds present.

Elevation: 800 to 1200 feet

Soils: probably derived from loess and river deposits of silt and sand, with a surface peat layer in some areas. Soils are generally wet and have permafrost except upper slope positions in burned areas.

Vegetation/land cover: mostly tussocks and low shrubs in low areas, black spruce forest or white birch forest (where burned) on slopes.

Fire history: strongly affected by fires, including the 1950, 1969, and 1986 fires. The delineation in Township 6N Range 23E has no recorded fires but appears on aerial photographs to have burned in this century.

Notes: slight dissection of these old terraces makes them drier than the lower and younger terraces (units YV2, YV3, and YV4) and allows YV5 to have a more diverse vegetation mosaic. Deep thaw and establishment of deciduous trees and scrub after fire is possible on the higher parts of this unit, unlike most of YV2, YV3, and YV4.

YV6 Nation/Kandik/Bonanza Valleys

Geology and physiography: nearly level and gently sloping areas along the lower reaches of tributaries to the Yukon River. Sediments composed of alluvium and slope deposits.

Elevation: 700 to 1200 feet

Soils: in the narrow riparian zone, soils are derived from river deposits of silt, sand, and gravel, are well-drained and lack permafrost. Higher terraces and valley footslopes probably have wet, fine-grained soils with permafrost and a surface peat layer.

Vegetation/land cover: floodplain shrubs, poplar and white spruce forest in the narrow riparian zone; the wet terraces and footslopes have tussock wetland or black spruce woodland.

Fire history: burned in 1950 (lower Charley and part of the Kandik River plains) and in 1969 (Bonanza Creek). Burns are probably spotty due to low flammability of some of the vegetation (floodplain scrub). Also, tussock wetland probably recovers quickly from fires.

Notes: this unit is similar to unit YV7 but separated here due to the meandering nature of streams in unit YV6 (YV7 has braided streams) and its narrower dry riparian zone with consequently wider wet terraces. The riparian vegetation in unit YV6 is probably similar to unit YV1 and the wet terraces to unit YV3.

YV7 Tatonduk Valley

Geology and physiography: nearly level and gently sloping areas along the lower reaches of Tatonduk River. Sediments composed of alluvium and slope deposits.

Elevation: 800 to 1200 feet

Soils: in the riparian zone, soils are derived from river deposits of silt, sand, and gravel, are well-drained and lack permafrost. Higher terraces and valley footslopes probably have wet, fine-grained soils with permafrost and a surface peat layer.

Vegetation/land cover: floodplain shrubs, poplar and white spruce forest in the riparian zone; the wet terraces and footslopes have tussock wetland or black spruce woodland.

Fire history: no fires recorded. Much of the vegetation (deciduous floodplain scrub, poplar forest) has low flammability.

Notes: this unit is similar to unit YV6, but is separated due to the braided nature of the Tatonduk River (as opposed to mostly meandering streams in unit YV6) and more extensive dry riparian zone relative to tussock wetland.

YV8 Yukon River

Geology and physiography: primarily water, but also includes some small, frequently flooded bars and islands in the Yukon River composed of alluvium.

Elevation: 600 to 1000 feet

Soils: soils on bars and islands are derived from river deposits of silt, sand, and gravel, are well-drained and lack permafrost.

Vegetation/land cover: mostly water; unvegetated, sparsely vegetated, or floodplain shrubs on bars and islands. Proportion of bars and islands varies with the water level.

Fire history: no fires. The area of YV8 shown as burned in Table 6 is due to an error in mapping or map registration.

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Tables

Table 1. National Hierarchical Framework of Ecological Units*

Ecoregion (<1:5,000,000)
Subregion
Section (1:7,500,000 to 1:3,500,000)
Subsection (1:3,500,000 to 1:250,000)
Landscape
Landtype association (1:250,000 to 1:60,000)
Land unit
Landtype (1:60,000 to 1:24,000)
Landtype phase (>1:24,000)

*from Cleland *et al.*, 1997; typical mapping scales for each level are given in parentheses

Table 2. Index to Ecological Units of Yukon-Charley Rivers National Preserve

Subsection		**Detailed Ecological Unit**	
Symbol	***Name***	***Symbol***	***Name***
BH	Biederman Hills	BH1	Biederman Hills
		BH2	Biederman Hills bluffs
CF	Charley Foothills	CF	Charley Foothills
HL	Hard Luck Lowland	HL	Hard Luck Lowland
KT	Kandik Tableland	KT	Kandik Tableland
LB	Little Black River Hills	LB1	Little Black River Hills
		LB2	Little Black River Hills bluffs
MT	Upper Charley Mountain Tundra	MT1	Upper Charley Mountain Tundra: high and rugged
		MT2	Upper Charley Mountain Tundra: barren domes
		MT3	Upper Charley Mountain Tundra: gentle vegetated ridges
OF	Ogilvie Foothills	OF1	Ogilvie Foothills
		OF2	Ogilvie Foothills bluffs
OM	Ogilvie Lime/dolostone Mountains	OM	Ogilvie Lime/dolostone Mountains
SD	Snowy Domes	SD	Snowy Domes
TF	Three Fingers Subalpine Basin	TF	Three Fingers Subalpine Basin
TH	Tintina Hills	TH	Tintina Hills
TL	Thanksgiving Loess Plain	TL	Thanksgiving Loess Plain
UC	Upper Charley Valleys	UC1	Subalpine valleys
		UC2	Beverly/Copper/East Fork mountain slopes
		UC3	Copper Creek tussock slopes
		UC4	Upper Charley plain
YV	Yukon River Valley	YV1	Yukon River active floodplain
		YV2	Wet terraces with oxbows
		YV3	Wet terraces with few ponds
		YV4	Wet terraces with thermokarst lakes
		YV5	High terraces, undulating
		YV6	Nation/Kandik/Bonanza Valleys
		YV7	Tatonduk Valley
		YV8	Yukon River

Table 3. Summary of Criteria Used to Delineate Subsections in Yukon-Charley Rivers National Preserve

Ecological Subsection	Delineation Criteria
BH - Biederman Hills	Hills and rounded low mountains with elevations below treeline, composed of well-cemented sedimentary rocks (mostly argillite). Generally steeper than units LB and TH, but more gentle than unit OF.
CF - Charley Foothills	Hills and low mountains composed of granitic and metamorphic rocks, south of the Yukon River and south of the Tintina Fault. Bedrock differs from other hill units (BH, LB, OF, and TH), which are composed of sedimentary rocks. Mostly below treeline except from some ridgetops.
HL - Hard Luck Lowland	Gently sloping basin north of the Yukon River near the Ogilvie Mountains. Sediments are slope deposits and loess over bedrock (in contrast to the alluvium of the adjacent YV unit).
KT - Kandik Tableland	Undulating plain dissected by small streams and surrounded by higher hills. Better drained than the nearby HL unit due to dissection by streams, and composed of argillite (as compared to softer sedimentary rock of the HL unit).
LB - Little Black River Hills	Gentle hills with elevations well below treeline, composed of basalt, gabbro, and argillite. Forms a high bluff along the Yukon River that is less rugged than other bluffs. Hills behind the bluff extend well outside the Preserve and are more gently sloping than other nearby hill units (BH and TH).
MT - Upper Charley Mountain Tundra	Mountains with many broad, rounded ridgetops, but steep cliffs and sharp ridge crests in some areas. Composed of granitic rocks and schist. Located almost entirely above treeline. More rugged and higher than the adjacent CF, UC, and TF units.
OF - Ogilvie Foothills	Steep hills, almost entirely below treeline but with some exposed rock on ridgetops. Composed of a variety of sedimentary rocks, complexly faulted. Steeper than units BH and TH.
OM - Ogilvie Lime/dolostone Mountains	Rugged mountains with steep, mostly forested slopes and sharp ridge crests that extend above treeline. Bedrock is mostly carbonate rocks and shale, and is exposed on ridge crests. Higher and more rugged than the OF unit, with carbonate rocks more prevalent.
SD - Snowy Domes	Rounded mountains north of the Yukon River that are mostly above treeline and composed of sedimentary rock (mostly conglomerate, with minor limestone and shale). Higher than adjacent hill units. Bedrock differs from other mountains units (granite/schist in MT and carbonate rocks in OM), and ridges much more rounded than OM.
TF - Three Fingers Subalpine Basin	A region of gentle hills composed of granitic rocks and schist, surrounded by higher mountains in the upper Charley River region. Elevations are near treeline. Resembles unit UC but occurs in a distinctive broad basin; UC consists of narrower U-shaped valleys or steeper slopes near Charley River and its tributaries.
TH - Tintina Hills	Hills and rounded low mountains at elevations below treeline, composed of mostly of soft sandstone, mudstone, and conglomerate. Less steep than units BH and OF, and has a different bedrock composition (younger, poorly cemented sedimentary rocks except in the northernmost part).
TL - Thanksgiving Loess Plain	Gently sloping plain with thick loess cover over bedrock of unknown composition. Separated from the YV unit by a prominent escarpment, and probably lacks the underlying alluvium of YV. In contrast to the other non-alluvial lowland units in the study area (KT, HL, in small basins among mountains), TL is part of a large lowland region - the Yukon Flats.
UC - Upper Charley Valleys	Various landforms in valleys of the upper Charley River region, mostly at elevations near or below treeline (although not everywhere forested due to wet soils on gentle slopes). Includes U-shaped valleys with scattered trees, steeper slopes in more dissected areas of the Charley River valley, some distinctive gentle slopes with tussock tundra vegetation, and the riparian area of the upper Charley River. Differs from the adjacent MT units in its lower elevation, lower slope position, and forest vegetation in places. Resembles the TF units but separated due to the latter's unique topography (a broad basin of gentle hills near treeline, surrounded by higher land).
YV - Yukon River Valley	Nearly level or gently sloping areas along the Yukon River and its tributaries, composed of river deposits (overlain by loess on older surfaces). Vegetation of some wetter portions resembles that of adjacent lowlands, but the YV unit is lower (separated in most places by a distinct escarpment from adjacent lowland units HL, KT, and TL), flatter, has much more open water, and is underlain by alluvium not bedrock.

Table 4. Area of Subsections

Ecological Subsection	Count of Polygons	Area		
		Acres	Hectares	Km^2
BH	8	141316	57051	571
CF	1	280775	113353	1134
HL	7	39819	16076	161
KT	2	28628	11557	116
LB	4	59183	23893	239
MT	53	611279	246782	2468
OF	8	300004	121116	1211
OM	4	51503	20793	208
SD	2	2860	1155	12
TF	1	67742	27348	273
TH	4	286870	115813	1158
TL	1	74442	30053	301
UC	17	289109	116717	1167
YV	117	291570	117711	1177
All	229	2525099	1019418	10196

Table 5. Earth Cover Composition of the Detailed Ecological Units

(Area occupied by each earth cover class, in % of the ecological unit)

Ecological Unit	Closed Needleleaf	Open Needleleaf	Open Needleleaf - Lichen	Woodland Needleleaf	Woodland Needleleaf - Lichen	Woodland Needleleaf - Moss	Closed Deciduous	Open Deciduous	Closed Mixed Needleleaf/Deciduous	Open Mixed Needleleaf/Deciduous	Tall Shrub	Low Shrub	Low Shrub - Lichen	Low Shrub - Tussock Tundra	Dwarf Shrub	Wet Sedge	Dry Herbaceous	Tussock Tundra	Tussock Tundra - Lichen	Aquatic Bed	Clear Water	Turbid Water	Snow	Sparse Vegetation	Rock/Gravel	Cloud	Cloud Shadow	Terrain Shadow	Fire (Burn)	Unit as % of Preserve
BH1	0.4	40.8	0.2	4.1	0.1	0	16.6	0.9	16.1	5.4	-	1	-	0.7	0.1	0	0	0.1	-	-	0	0.1	-	0.4	0.1	-	-	6.8	5.9	5.3
BH2	0.3	16.2	-	3.2	0.1	0	25.3	7.6	9.7	5.7	-	5.3	-	3.2	-	0	-	0.3	-	-	0.1	1.3	-	12.4	1.7	-	-	2.6	5	0.3
CF	0.3	42.5	0	20.8	0.2	0.1	2.9	0.3	3.4	4	0.4	4	-	3.3	0.2	-	0	0.9	-	-	0.2	-	0	0.5	0.1	-	-	6.7	9.1	11.2
HL	0.5	66.9	-	14.9	1.8	0.1	2	0.3	2.4	3.8	-	2.4	-	3.1	-	-	-	0	-	-	0	-	-	0	0	-	-	1.6	-	1.6
KT	0.7	38.3	-	13.8	0.1	0.4	16.2	0.5	16.3	8.2	-	1.6	-	1.3	-	0	-	0.1	-	-	0	0.1	-	0	0	-	-	2.2	-	1.1
LB1	0.3	49.6	0.2	6.9	0	0	2.6	1.6	2.5	2.5	-	1.4	-	0.4	-	-	0	0	-	-	-	-	-	0.1	0	-	-	1.7	30.1	1.7
LB2	0.6	29.4	-	4.1	0.1	0.1	9.4	6.4	9.4	6.4	-	2.8	-	1.9	-	-	-	0.1	-	-	0.2	2.7	0	2.4	0.4	-	-	6.5	17.1	0.7
MT1	-	0.1	-	0.2	0	-	-	-	-	0	0.1	2.3	-	1.1	9.7	-	0.3	0.1	-	-	0.1	-	9	11.3	51	-	-	14.9	-	1.2
MT2	0	2.7	-	3.9	0	0	0	-	0	0.3	2.1	21.5	-	4.6	22.2	-	2.7	0.5	-	-	0.1	-	1.3	13.4	19.6	-	-	5.1	0	12.8
MT3	0	11.4	-	15.2	0.1	0	0.2	0	0.1	1.1	4.9	37.1	0	9.4	11	-	1.4	2.1	0	-	0	-	0	2.8	1.3	-	-	1.6	0.2	10.2
OF1	1.1	45.2	-	5.6	0.2	0	11.9	2.2	10.1	5.5	0.6	3.1	-	1.9	0.1	0	0	0.1	-	-	0.1	0	0	0.6	0.1	0.1	0.1	11.4	-	11.6
OF2	0.6	15.1	-	3.3	0.1	0.1	26.2	9.4	15.4	6.5	1.1	7.4	-	4.2	-	-	-	0.4	-	-	0	0.8	-	7	0.7	-	-	2	-	0.3
OM	0.6	34.2	-	7.3	0.3	0	0.7	0.1	2	3.1	2.1	10.4	-	2.8	5.5	-	1.6	0.1	-	-	0	-	0	8.3	3	0.6	0.1	17.1	0	2
SD	-	7.1	0	15.9	0	-	0.4	0.8	0.1	2.3	1.4	14.4	-	12.8	2.3	-	3.2	2.6	13.9	-	-	-	-	0.3	0	-	-	-	22.4	0.1
TF	0	25.3	-	15	-	0	-	-	0	0.2	1.7	38.3	-	15.2	1.6	-	0.1	1.7	-	-	0	-	-	0.5	0.2	-	0	0.1	-	2.7
TH	0.2	31.3	-	16.1	0.1	0	12.9	1.8	9.5	14.9	0	6.1	-	4.9	0	0	0	0.2	-	-	0	0	-	0.1	0	-	-	1.8	-	11.4
TL	1.3	49.8	-	22	0	0.3	8.1	0.2	8.1	3.8	-	1.6	-	3	0	-	0	0.4	-	-	0.2	0	-	0.1	0	-	-	1	-	3
UC1	0.1	20	-	31.5	-	-	0.1	0	0.1	1.5	3.1	22.4	0	12.9	1.7	-	0.2	3.6	-	-	0	-	-	1.3	0.8	-	-	0.8	-	1.8
UC2	0.1	35.2	-	35.4	0.1	0	0.1	-	0.1	1.1	1.9	11.3	0	8.7	0.6	-	0	3.6	0	-	0.2	-	0	0.7	0.2	-	-	0.7	-	8.4
UC3	0.3	18.8	-	21.3	0	-	0	-	0	0.3	0	3.2	0.5	27.8	0.1	-	0	24.7	0.4	-	1.2	0	-	0.4	0.4	-	-	0.4	-	0.9
UC4	0.6	32.8	-	26.1	-	-	0	-	0.1	0.6	0	5.6	-	18.3	0.2	-	-	8.2	-	-	2.2	-	-	2.1	1.8	-	-	1.3	-	0.4
YV1	1.9	21.2	-	2.5	0	0.2	25.9	0.1	13.1	3.1	-	0.3	-	0.4	-	0	-	0	-	-	1.3	18.6	-	7.6	3.5	0.1	-	0.2	0	1.1
YV2	0.9	36.6	-	28.6	0.7	0.2	3	0.1	4.5	2.7	-	8	-	6.9	-	0.7	-	0	-	0	6.2	0.5	-	0.2	0.1	-	-	0.1	-	0.5
YV3	1.3	32.5	-	29.2	0.3	0.6	3.4	0.3	3.7	4.9	-	6.7	-	13.9	-	0.2	-	0.3	-	0	0.9	0.7	-	0.3	0.2	-	-	0.3	0.4	3.2
YV4	0.3	28.3	-	24	0.3	1	1	0.2	1.9	1.6	-	2.5	-	5.1	-	0.3	-	0	-	-	31.3	0.1	-	0.1	0.1	-	-	0.1	1.7	0.1
YV5	4.1	55.7	0	10.6	0.1	0	7.9	0.2	10.9	4.3	-	1	-	1.5	0	0	0	0.1	-	0	0.5	0.3	-	0.1	0.1	-	0.1	0.7	1.9	2.1
YV6	1.3	33.7	-	24.4	0.7	0.5	5.1	0.3	7.5	5.6	-	5.2	-	7.8	0	0	-	1.2	-	-	2.9	0.1	-	0.6	0.2	-	0	1.5	1.1	2.8
YV7	3.1	54.9	-	3.2	0.1	0	8.2	0.1	14.7	3.2	-	0.3	-	0.2	-	-	-	0	-	-	6.1	-	-	1.8	1.5	-	-	2.6	-	0.2
YV8	0.1	2.2	-	0.4	0	0	3.2	0	0.8	0.4	-	0.1	-	0.2	-	0	-	0	-	-	0.3	86	-	3.5	2.8	0	-	0.1	0	1.4
ALL	0.5	30	0	14.7	0.1	0.1	5.6	0.7	5	4.3	1.2	11.4	0	5.4	4.4	0	0.5	1.2	0	0	0.3	1.5	0.3	2.8	3.5	0	0	4.3	2.1	100

*Computed by overlay of the ecological units on the "Yukon-Charley/Black River/Forty Mile Earth Cover Classification" by Ducks Unlimited, 1998. Dash indicates none; 0.0 indicates present but <0.1%

Table 6. Area of Major Earth Cover Classes in the Detailed Ecological Units* (Area, km2)

Ecological Unit	Closed Needleleaf	Open Needleleaf	Open Needleleaf - Lichen	Woodland Needleleaf	Woodland Needleleaf - Lichen	Woodland Needleleaf - Moss	Closed Deciduous	Open Deciduous	Closed Mixed Needleleaf/Deciduous	Open Mixed Needleleaf/Deciduous	Tall Shrub	Low Shrub	Low Shrub - Lichen	Low Shrub - Tussock Tundra	Dwarf Shrub	Wet Sedge	Dry Herbaceous	Tussock Tundra	Tussock Tundra - Lichen	Aquatic Bed	Clear Water	Turbid Water	Snow	Sparse Vegetation	Rock/Gravel	Area of Ecological Unit	Count of Major Components
BH1	222						90.4		87.8	29.4																544	5
BH2	4.2						6.6	2	2.5	1.5		1.4												3.2		26	7
CF	483	237																								1136	8
HL	108	24.1																								161	8
KT	44.4	16					18.8		18.9	9.5																116	7
LB1	85.2	11.9																								172	7
LB2	19.8						6.3	4.3	6.4	4.3																67	8
MT1														11.8									11	13.8	62.3	122	5
MT2												280		289										175	255	1303	10
MT3	119	159										387	98	115												1044	10
OF1	533	66.2					140		119	65.3																1179	9
OF2	5.4						9.3	3.3	5.5	2.3		2.6												2.5		36	8
OM	71.2	15.3										21.7		11.5										17.3		208	11
SD	0.8	1.8										1.7	1.5					1.6								12	9
TF	69.5	41										105	41.8													274	7
TH	364	187					150		110	173		70.9														1161	8
TL	150	66.4					24.5		24.3																	301	8
UC1	35.7	56.4										40	23.1													179	9
UC2	302	304										96.7	74.6													858	7
UC3	18.1	20.4											26.7				23.8									96	5
UC4	12.1	9.6										2.1	6.7				3									37	7
YV1	23.8						29.1		14.7												20.8			8.6		112	9
YV2	17.3	13.6										3.8	3.3							2.9						47	8
YV3	106	95										21.8	45.1													325	7
YV4	3.1	2.6											0.6							3.5						11	5
YV5	118	22.5					16.7		23.1																	212	8
YV6	95.4	69					14.5		21.3	15.9		14.8	22.1													283	10
YV7	9.2						1.4		2.5											1						17	9

*

Computed by overlay of the ecological units on the "Yukon-Charley/Black River/Forty Mile Earth Cover Classification" by Ducks Unlimited, 1998. Differs from Table 5 in that cells for minor components (those composing <5% of their ecological unit) are blank, and columns for non-habitat cover types (Cloud, Cloud Shadow, Terrain Shadow, and Fire/Burn) have been deleted.

Table 7. Area Burned of the Detailed Ecological Units by Year, 1950-96[1]

Ecologic Unit	Percent of area burned in each ecological unit by year [2]													
	1950	1954	1957	1958	1967	1969	1971	1977	1986	1991	1993	1994	1996	All Yrs[3]
BH1	16	-	-	-	-	-	-	-	9	-	-	-	-	25
BH2	37	-	-	-	-	-	-	-	22	-	-	-	-	59
CF	5	-	-	-	-	12	-	-	-	13	3	-	-	34
HL	-	-	9	-	19	-	-	-	-	-	-	-	-	28
KT	24	-	-	-	-	10	-	-	-	-	-	-	-	35
LB1	-	20	-	-	-	-	-	16	35	-	1	-	-	72
LB2	-	1	-	-	-	-	-	21	20	-	-	-	-	43
MT1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MT2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MT3	2	-	-	-	-	-	-	-	-	1	1	-	-	4
OF1	-	-	-	1	0	23	3	-	-	-	0	0	0	28
OF2	-	-	-	-	-	-	6	-	-	-	2	-	-	8
OM	-	-	-	-	-	-	-	-	-	-	-	-	3	3
SD	-	-	-	-	-	-	-	-	15	-	5	-	-	20
TF	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TH	6	-	0	-	1	69	-	-	-	-	2	-	-	79
TL	-	-	20	-	-	-	-	-	-	-	10	-	11	41
UC1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UC2	-	-	-	-	-	-	-	-	-	-	-	0	-	-
UC3	-	-	-	-	-	-	-	-	-	-	-	1	-	1
UC4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
YV1	1	-	-	-	-	14	-	-	1	-	-	-	-	15
YV2	18	-	-	-	-	1	-	-	-	-	-	-	-	19
YV3	-	-	-	-	-	30	-	-	2	-	-	-	0	32
YV4	-	-	-	-	-	-	-	-	5	-	-	-	-	5
YV5	15	-	-	-	-	29	-	-	2	-	-	-	-	47
YV6	10	-	-	-	3	26	3	-	1	1	-	-	-	43
YV7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
YV8	-	-	-	-	-	5	-	-	-	-	-	-	-	5
Entire Preserve	4	-	1	0	-	15	-	-	1	2	1	-	-	25

[1]Computed by overlay of the ecological units on the fire history database of the USDI-BLM Alaska Fire Service.
[2]Missing years between 1950 and 1996 had no fires recorded in the Preserve; no data pre-1950 and post 1996
[3]A simple row sum; does not account for possible overlap of fires

Table 8. Climatic data for Circle City, Alaska

65° 50' N, 144° 4' W, elevation 183 m (600 ft)
Start yr. - 1957 End yr. - 1999
(27 years available out of 43 requested in this analysis)

Month	Temperature (Degrees F.) avg daily max	avg daily min	avg	2 yrs in 10 will have max temp. >than	2 yrs in 10 will have min temp. <than	avg # of grow deg days*	Precipitation (Inches) avg	2 yrs in 10 will have less than	2 yrs in 10 will have more than	avg # of days w/.1 or more	avg total snow fall
January	-10.4	-26.0	-18.2	33	-61	0	0.45	0.16	0.76	1	6.5
February	-5.4	-25.3	-15.4	37	-56	0	0.46	0.16	0.71	1	6.4
March	13.3	-14.7	-0.7	45	-42	0	0.32	0.08	0.57	1	4.5
April	35.2	6.6	20.9	61	-27	5	0.26	0.11	0.62	1	2.9
May	58.2	31.3	44.8	82	10	184	0.27	0.08	0.66	0	0.1
June	71.9	46.9	59.4	89	30	518	0.87	0.30	1.47	2	0.0
July	74.0	49.8	61.9	90	36	606	1.14	0.38	1.76	3	0.0
August	67.9	43.5	55.7	87	25	412	1.23	0.56	1.92	4	0.0
September	52.5	29.4	40.9	74	10	102	0.55	0.26	0.81	3	0.8
October	25.5	10.1	17.8	52	-23	0	1.00	0.37	1.52	4	6.8
November	1.6	-13.6	-6.0	35	-42	0	0.82	0.31	1.25	3	7.9
December	-6.2	-22.2	-14.2	37	-53	0	0.68	0.32	0.99	2	7.1
Yearly :											
Average	31.5	9.7	20.6	---	---	---	----	----	----	---	---
Extreme	93	-67	---	91	-69	---	----	----	----	---	---
Total	---	---	---	---	---	1827	8.04	3.58	8.17	25	42.9

Average # of days per year with at least 1 inch of snow on the ground: 139

*A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minumum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (Threshold : 40.0 deg. F)

Table 9. Climatic Data for Eagle, Alaska

64° 47' N, 141° 12' W, elevation 259 m (850 ft)
Start yr. - 1949 End yr. - 1999

Month	Temperature (Degrees F.) avg daily max	avg daily min	avg	2 yrs in 10 will have max temp. >than	2 yrs in 10 will have min temp. <than	avg # of grow deg days*	Precipitation (Inches) avg	2 yrs in 10 will have less than	2 yrs in 10 will have more than	avg # of days w/.1 or more	avg total snow fall
January	-4.3	-22.3	-13.3	37	-63	0	0.51	0.22	0.75	2	6.8
February	3.8	-18.6	-7.4	42	-60	0	0.44	0.17	0.67	1	6.9
March	22.4	-7.5	7.4	49	-45	0	0.32	0.14	0.50	1	4.7
April	41.8	14.1	27.9	64	-22	15	0.34	0.15	0.60	1	3.6
May	58.6	31.6	45.1	79	13	193	0.99	0.46	1.48	3	0.7
June	70.2	43.5	56.9	87	29	503	1.68	0.93	2.35	5	0.0
July	72.9	47.0	59.9	89	34	613	2.16	1.33	2.90	6	0.0
August	67.0	41.2	54.1	86	25	436	1.94	1.18	2.62	6	0.0
September	54.0	30.8	42.4	73	10	128	1.21	0.57	1.76	4	0.9
October	31.7	14.5	23.1	56	-20	5	0.94	0.50	1.32	3	9.7
November	11.1	-5.6	2.8	42	-43	0	0.67	0.30	1.01	2	10.8
December	0.2	-16.9	-8.4	38	-56	0	0.70	0.34	1.01	2	10.9
Yearly :											
Average	35.8	12.6	24.2	---	---	---	----	----	----	---	---

Extreme	97	-71	---	91	-65	---	----	----	----	---	---
Total	---	---	---	---	---	1892	11.89	7.05	13.74	36	55.1

Average # of days per year with at least 1 inch of snow on the ground: 145

*A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minumum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for t principal crops in the area (Threshold : 40.0 deg. F)

Figures

Fig. 1. Location of Yukon-Charley Rivers National Preserve in Alaska

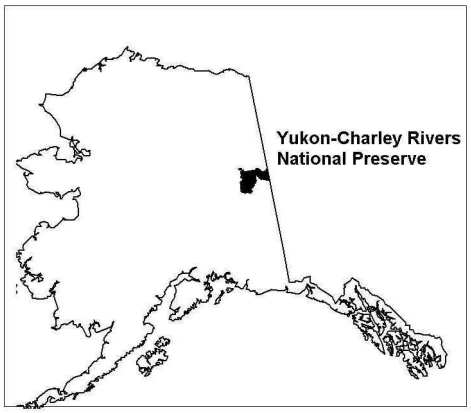

Fig. 2. Ecological Subsections of Yukon-Charley Rivers National Preserve

For an explanation of the mapping unit symbols, see Table 2.